

---

**32nd WEDC International Conference, Colombo, Sri Lanka, 2006**
**SUSTAINABLE DEVELOPMENT OF WATER RESOURCES, WATER SUPPLY AND ENVIRONMENTAL SANITATION**
**A Willingness to Pay for Maintenance and Operation of Rural DWS Schemes**

*Betman Bhandari, Miriam Grant and Shauna Curry, Canada*

---

*Improved planning methodology is sought for sustainable and replicable rural water schemes. Improved methodology should have a mechanism to recover the necessary resources for operation and maintenance costs from water users. This paper analyses the differences between the users' willingness to pay in rural markets and village DWS schemes of Nepal based on information collected through a questionnaire survey of 205 households and institutional survey of 12 DWS water user committees. Due to different socio-economic scenarios among rural villages and rural market centres, core problems in management and operation of their DWS schemes are immensely different. Weak institutional capability is the prime problem in rural village DWS schemes. On the contrary, technicalities such as insufficient water quantity and inconvenient locations of water points are the major problems in rural market centres. Moreover, users' satisfaction level is influential for operation and maintenance of both rural DWS schemes.*

---

**Introduction**

Governments in developing countries have often subsidized water supplies, typically in an attempt to achieve social and health benefits for the low-income households which form the large majority of the rural population (Whittington et al., 1998). Furthermore developing countries have made a huge investment in their rural water supply with the assumption that local communities will be involved in their maintenance and operation. The different evaluation reports of Drinking Water Supply (DWS) reveal that many rural schemes are dysfunctioning. Most of the water user committees (WUCs) are not active due to the incapability to mobilize local people, there are insufficient funds for maintenance, and division of local user's unity due to their faith in different political parties (Bhandari and Wickramanayake, 2001).

The process of development, including urbanization, is a result of historical, cultural, political and economic development. Historically, the development of market centres in Nepal capitalized on the commercial benefits derived from the flow of goods and services from external manufacturing centres to meet the needs of the surrounding rural areas. Similarly the rural market centres, lying at the junction of two or three villages have few shops, banking services and governmental service centres. Due to a subsistence economy and unemployment, internal migration pressure is increasing in rural market centres. Relatively high infrastructure facilities of market centres have become a prime attraction for the internal migration. Consequently due to a high growth rate, pressure on infrastructure developments like water supply schemes is increasing day by day.

According to the Nepal government policy, operation and

maintenance costs of DWS projects in rural areas should be covered by the community itself and the investment cost for DWS projects will be financed by the government or donor agencies (NPC, 1998). The communities may also contribute to the investment cost of the project by providing labour, land and local materials. A sustainable water future depends on an appropriate water price and the necessary resources need to come from project consumers (World Bank 1993). Some scholars focused on community water education and building organisational capacity to ensure the project sustainable (Baker et al., 2006). A study on household demand for improved water supply system in Kathmandu shows that consumers' willingness to pay for improved water service is increasing (Whittington et al, 2002). In view of consumers' satisfaction, there is no influence in willingness to pay in urban DWS schemes (Raje et al, 2002). The primary objective of this study was to determine the variables, which influence users' willingness to pay for operation and maintenance of rural village and market centre DWS schemes.

**Methodology**

A three-pronged survey instrument was applied in this research study. Firstly, discussion with key informants about the strengths and weaknesses of existing water supply schemes and their management, secondly, random institutional survey of water user committees, and lastly a systematic random household survey was launched at 205 households.

The indicators of satisfaction level and supply condition refers to different factors like reliability of water distribution system (REL), quantity and quality of water, convenient water point location (CWPL), pressures in the tap and effective

management of WUC (EMWUC) in the respondent’s area that were deducted from the factor analysis. A five-point Likert’s scale which ranged from not at all satisfied, not satisfied, partially satisfied, satisfied and highly satisfied was used to get the opinion of respondents on each of these factors. Also, a ranking question was included to find the importance assigned by respondent to these factors. The last section included questions relating the respondent’s willingness to pay (WTP) for improvements in operation and maintenance. The response was obtained on a dichotomous (Yes or No) scale. Also, the opinion of the respondent about trustworthy WUC and affordability of water charges was also sought on a dichotomous scale.

This study was carried out with two categories of rural water supply system in term of geographical location: village and rural market centre. Due to high numbers of INGOs and NGOs working in the drinking water sector, the sample size has been chosen from two districts: Kavre from the mid-region and Baglung of the western region of Nepal. The sample size for a total household of 2098 was computed from the Arkin and Colton formula.

**Table 1. Sample size for household survey**

Water supply projects in rural market centre			
Sample scheme	No. of project	Benefited Households	Sample size
INGO-DWS Scheme	2	215	26
NGO-DWS Scheme	2	165	17
GO-DWS Scheme	2	391	45
Total	6	771	88 (11%)
Water supply projects in rural villages			
INGO-DWS Scheme	2	308	34
NGO-DWS Scheme	2	383	40
GO-DWS Scheme	2	636	43
Total	6	1327	117 (9%)
<b>Sample size</b>	<b>12</b>	<b>2098</b>	<b>205 (9.77%)</b>

## Results and discussions

### User’s priorities and the satisfaction level

Women are traditional managers of DWS; therefore, 60 percent of the total respondents chosen for the household survey are women. The analysis of the study (Table 2) reveals that respondent’s preferences from rural market centre and village area are different. According to the responses from rural market centre, users are more concerned about water sufficiency, water pressure at tapstands and convenience of

water point location. On the other side, reliability of water supply, effective water user committee and convenient water point locations are the major concerns for the rural village users. Convenient water point location is a common problem in both areas.

**Table 2. Weightings on indicators of satisfaction level**

Indicators	Rural Market centre	User’s priority	Rural Village	User’s Priority
EMWUC	0.2097	VI	0.1185	I
Quality	0.2001	V	0.2104	V
CWPL	0.1628	III	0.1249	II
Quantity	0.1038	I	0.2132	VI
Pressure	0.1330	II	0.2001	IV
REL	0.1906	IV	0.1329	III

The result shows that users from both village and market centre are less concerned about water quality. Dissatisfaction with water user committee in management is relatively high in rural areas.

Usually WUCs of rural DWS schemes face problems in the rainy season. Flooding of intake structures and wash-out of supply pipelines are a periodic problem in the rainy season. The result is skepticism about the reliability of the water supply among the consumers. In discussion’s with the rural water schemes’ WUC members they mentioned that they were unaware of the importance of water point location during the engineering details survey. Consequently, some water points are located on private land and some are in the middle of the congested village, which causes inconvenience fetching water and problems with drainage of wastewater. Moreover, a small waste water pond in front of water point becomes a source of mosquito breeding. Likewise, WUC members of rural market centre mentioned that due to burgeoning number of new houses, they are facing water shortages in the dry season.

### Synthesis of group discussion

According to the manual for rural DWS of Nepal, the WUC has authority to raise maintenance and operation funds from each household. Besides government-installed DWS, WUCs in the study areas are raising funds annually and some households contributed grains 6-10 pathi (Approx. 1 pathi =4 kg and price of grain in local market is Rs. 10-15) to reward the village maintenance worker. Most DWS schemes of Nepal have considered the poor of the poorest families to be exempt from water tariffs. This type of decision is usually settled during the project installation. The WUC have responsibility to evaluate and monitor these issues.

The WUC has a responsibility to pay wages for the village maintenance workers. According to the result of the rural DWS institutional survey, on the basis of past three years (2001-2003), WUC (of NGO installed projects) are raising Rs. 240-600 (US\$ 1 =Rs. 72) annually from each household for operation and maintenance. Similarly, INGO installed projects have charged Rs. 600-1200 per year as a water maintenance and operation cost. Government installed schemes have no such money raising practices. However, all water schemes have bylaws that water users should be responsible for repairs and maintenance of the water faucet, and for cleanliness of tap-stand platform. The researchers found that all WUCs in rural market centres have bylaws that Rs. 50-150 per month or Rs. 600-1800 annual water tariff should be paid by all households. Village centre water committees mentioned that 10-15 percent of the total households have not paid this water tariff; however, they are trying to convince and remind them of their dues at each meeting. On the other hand some village WUCs mentioned that more than 50 percent of households are defaulters and have not paid water dues for two or three years. The WUC often stressed that they have no authority to punish or force households to make payment. Government authorities are also located geographically far from their community so the appealing procedure to ensure enforcement is also complex and lengthy. In market centres WUC realized that these types of issue are settled best by community consensus.

Different views and problems were identified in the discussion with rural market centre and village DWS water user committees. According to the ranking technique, rural village water committees have the following leading problems:

1. Money (water tariffs) collection from water users for the maintenance and operation.
2. Retaining maintenance workers in project areas. They often leave the village to search for higher paid jobs.
3. Frequent damage by natural disasters such as land slide, flood and forest fire.

On the other hand, market centres have the following major problems:

1. During peak hours the numbers of consumers per water point becomes very high therefore large numbers of households who are far from the piped tap stands are compelled to search for other unprotected sources.
2. The Majority of households use water in the kitchen and garden; therefore, they have acute shortage for 3-4 months in dry seasons.
3. Water pressure in taps is not enough in the upper part of settlement area.

These results show that WUCs of market centres are good enough for administration of DWS project however they are facing technical problems. Due to unexpected growth of households and increasing awareness about health and hygiene, the water consumption rate is high in the market centres. Village WUCs have managerial problems; therefore, insufficient managerial skill of WUC members is the root cause in rural village DWS schemes.

### Satisfaction level versus willingness to pay

The first assumption to be tested was whether the satisfaction level of users affects their willingness to pay for the operation and improvement of DWS schemes. The analysis of this study revealed that satisfaction level, affordability and effective WUC have significant influence on the probability estimate of willingness to pay.

**Table 3. Willingness to pay corresponding to different satisfaction level**

Satisfaction category	Rural Market centre			Rural Village		
	N	W	NW	N	W	NW
Not satisfied	12	5	7	10	3	7
Partially satisfied	31	11	21	54	20	35
Satisfied	36	27 (75%)	9	46	30 (65%)	16
Highly satisfied	9	7 (78%)	9	46	6 (86%)	16
Total	88	49	39	117	58	59

Note: W: Willing to pay, NW: Not willing to pay, N: Number of respondents

The willingness to pay corresponding to different satisfaction level (Table 3) shows that satisfied respondents in both schemes have high percent of WTP. A high percent of ‘not satisfied’ and ‘partially satisfied’ users had a lower willingness to pay for the maintenance and operation of DWS schemes.

For this purpose, two important issues should be considered before allocating water rates. Firstly, user’s satisfaction level, effective water user committee and affordability are crucial indicators. Secondly, more convenient location of water points need to be provided to further improve both types of DWS schemes.

### Conclusion

The Nepal government has allocated Rs. 8.26 billion in fiscal year 2003/04 to implement various water supply and sanitation projects (Ministry of Finance, 2003), however, after a few years these projects again would require repairs or rehabilitation. In the absence a diagnosis of core problems in rural DWS schemes, the same trends will repeat again and again. Although some communities raise grains for the wages of DWS maintenance workers, cash collection from each household is the main source for the maintenance and operation. Users’ satisfaction level, effective WUCs and affordability are crucial indicators during the allocation of water charges for each household.

The following are the three major findings of this study:

1. For further planning and management, the rural water supply schemes should be split into two categories: ‘village’ and ‘village market centre’.

2. Effective WUCs, water quantity, reliability, water pressure and quality are the major indicators to measure the users' satisfaction level in rural communities.
3. Users' satisfaction levels highly influence the willingness-to-pay for the maintenance and operation of rural village and market centre DWS schemes.

The results of this study show that the degree of satisfaction highly influences the willingness-to-pay for maintenance and operation in both types of schemes. Therefore, water engineers and planners need to consider separately the situation of rural villages and rural market centres during designing and planning phases. Although the problem of inconvenient locations of water points are the same in both types of DWS schemes, the study concludes that the nature of the problems are different: rural village DWS schemes are facing institutional and managerial problems like weak managerial skills of WUC; on the other hand, market centres are facing technical problems such as insufficient water quantity, and insufficient pressure head in the supply system.

## References

- Baker, C. D, Lentz R. and Curry S. (2006): Strategy of widespread implementation of numerous, independent small scale Household Water Treatment Programs. World Business Council for Sustainable Development, World Water Week in Stockholm.
- Bhandari, B. and Wickramanayake, B. (2001). Community Management and Water Quality in Rural Water Supply System in Nepal, *Asia Pacific Journal of Rural Development*, 10 (2):53-67, Thailand.
- Ministry of Finance (2003), Project Plans and Monitoring, Kathmandu, Nepal.
- National Planning Commission (1998). *The Evaluation Report of Eighth Five-Year Development Plan (1992–1997)*. His Majesty's Government of Nepal, National Planning Commission: Kathmandu, Nepal.
- Raje D.V., Dhobe P.S., and Deshpande A.W. (2002). Consumer's willingness to pay more for municipal supplied water: A case study. *Ecological Economics* 42:391-400.
- Whittington, D., Pattanayak S.K., Yang J. and K. C. Bal Kumar (2002). Household demand for improved piped water services: evidence from Kathmandu, Nepal. *Water Policy* 4 (6):531-556.
- Whittington D, Davis J. and McClelland E. (1998). Implementing a demand-driven approach to community water supply planning: A case study of Lugazi, Kenya. *Water International* 23 (3): 134–145.
- World Bank Water Demand Research Team. (1993). The demand for water in rural areas: determinants and policy implications. *The World Bank Research Observer*, 8(1):47–70.

## Contact addresses

- Betman Bhandari  
Centre for Affordable Water and Sanitation Technology (CAWST), Canada  
Email:bbhandari@cawst.org
- Miriam Grant  
University of Calgary, Canada  
Email:grant@ucalgary.ca
- Shauna Curry  
CAWST, Canada.  
Email:scurry@cawst.org